

INFORMATION NEEDS (4.20.05 group discussion-NOT A CONSENSUS PRODUCT)

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TASKS

1) Master list of research needs/recommendations

-base on existing drafts (NRC+, M&M, and Subcommittee)

-draft mitigation/management related recs from previous reports (e.g. NRCs, etc)

2) Summary list of top research priorities

➤ NOTE: need process recommendations to facilitate research

-short paragraph on how to best fund needed research? Base on research issues sections?

Scientific research depends on...

Common categories of information needs:

- A. Sound Sources and Sound Field Characterization
- B. Baseline Marine Mammal Information
- C. Effects of Anthropogenic Sound on Marine Mammals
- D. Mitigation
- E. Development of Mitigation and Research Tools

A. Sound Sources and Sound Field Characterization

- ~~As part of Develop~~-standardized ocean observation networks, ~~measure-measuring~~ a full range of acoustic parameters in order to better understand short- and long-term trends in ambient ocean noise levels on global, regional, and local scales, and allow for the development of models of ambient noise.¹

B. Baseline Marine Mammal Information

- Conduct research on the status, abundance, stock structure, life histories, and distribution of marine mammals, developing standardized methods and identifying important geographic and seasonal trends.²
- Develop, test, and validate models to characterize and predict marine mammal habitat use (e.g., cold spots and hot spots).³
- Conduct research and develop, test, and validate models to better understand the functions of marine mammal behavior, including communication.⁴

¹ Recommendations from Cox *et al.* in review, IWC/SC 2004, Miller *et al.* 2005, NRC 2003, NMFS in prep., Simmonds *et al.* 2003, Southall *et al.* in prep., and U.S. Navy 2005a support this.

² Recommendations from Cox *et al.* in review, Evans and Miller 2004, IWC/SC 2004, NRC 2003, Simmonds *et al.* 2003, and U.S. Navy 2005a support this.

³ Recommendations from Cox *et al.* in review, NRC 2003, and U.S. Navy 2005a support this.

⁴ Recommendations from Cox *et al.* in review, NMFS in prep., NRC 1994, and NRC 2000 support this.

- Conduct research and develop, test, and validate models to better understand marine mammal auditory systems and hearing capabilities, developing and refining new techniques, including auditory brainstem response (ABR) methods, as appropriate.⁵

C. Effects of Anthropogenic Sound on Marine Mammals

- Conduct long- and short-term research and monitoring, and develop, test, and validate models to better understand and predict the occurrence and consequences of marine mammal behavioral responses to anthropogenic sound exposure (including tolerance, habituation, sensitization, disturbance, and habitat avoidance or abandonment), as well as the relationship of these responses to physiological effects, with particular attention to sound exposures in important marine mammal habitat.⁶
- Conduct research and develop, test, and validate models to better understand and predict the onset and consequences of temporary and permanent threshold shifts and masking, as well as the types of sound exposure that cause them and their relationship to other auditory and behavioral effects.⁷⁸
- Conduct research to better understand and predict the occurrence and consequences of physiological effects from anthropogenic sound exposure, as well as the relationship of these effects to auditory and behavioral effects, including directed and opportunistic examinations of marine mammal anatomy, physiology, pathology, and strandings.⁹¹⁰
- Conduct retrospective analyses of stranding events, including comparisons of pathologies, environmental variables, and anthropogenic sound sources present.¹¹
- Conduct research and develop, test, and validate models to characterize population-level effects and biological significance of anthropogenic sound exposure.¹²
- [Conduct CEEs]

D. Mitigation

- Research the feasibility, appropriateness, practicality, and effectiveness of mitigation tools in various contexts.
- Investigate modification of sound sources to minimize adverse effects.

⁵ Recommendations from Cox *et al.* in review, Evans and Miller 2004, Jasny and Reynolds 1999, NMFS in prep., NRC 1994, NRC 2000, Simmonds *et al.* 2003, Southall *et al.* in prep., and U.S. Navy 2005a support this.

⁶ Recommendations from Cox *et al.* in review, Evans and Miller 2004, IWC/SC 2004, Miller *et al.* 2005, NMFS in prep., NRC 1994, NRC 2000, NRC 2003, Simmonds *et al.* 2003, Southall *et al.* in prep., and U.S. Navy 2005a support this.

⁷ Recommendations from NRC 2000, Southall *et al.* in prep., and U.S. Navy 2005a support this.

⁸ Recommendations from Miller *et al.* 2005, NMFS in prep., NRC 2000, Southall *et al.* in prep., and U.S. Navy 2005a support this.

⁹ Recommendations from Cox *et al.* in review, Evans and Miller 2004, Southall *et al.* in prep., and U.S. Navy 2005a, support this.

¹⁰ Recommendations from Cox *et al.* in review support this.

¹¹ Recommendations from Cox *et al.* in review and IWC/SC 2004 support this.

¹² Recommendations from Cox *et al.* in review, NRDC 1999, Simmonds *et al.* 2003, and Southall *et al.* in prep. support this.

E. Development of Mitigation and Research Tools

- Develop alternative sound source technologies.
- Develop tracking and tagging technologies, ABR techniques, and controlled exposure experiments (CEEs) as appropriate to investigate effects of anthropogenic sound.¹³
- Develop methods to understand the effects of anthropogenic sound on marine organisms and ecosystems, as well as cumulative and synergistic effects of multiple exposures to anthropogenic sound and exposures to other threats.¹⁴¹⁵¹⁶

¹³ Recommendations from Cox *et al.* in review, Evans and Miller 2004, Miller *et al.* 2005, NMFS in prep., NRC 2003, Southall *et al.* in prep., and U.S. Navy 2005a support this.

¹⁴ Recommendations from Jasny and Reynolds 1999, NRC 1994, NRC 2000, NRC 2003, Simmonds *et al.* 2003, Southall *et al.* in prep., and U.S. Navy 2005a support this.

¹⁵ Recommendations from NRC 1994, NRC 2000, Southall *et al.* in prep., and U.S. Navy 2005a support this.

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